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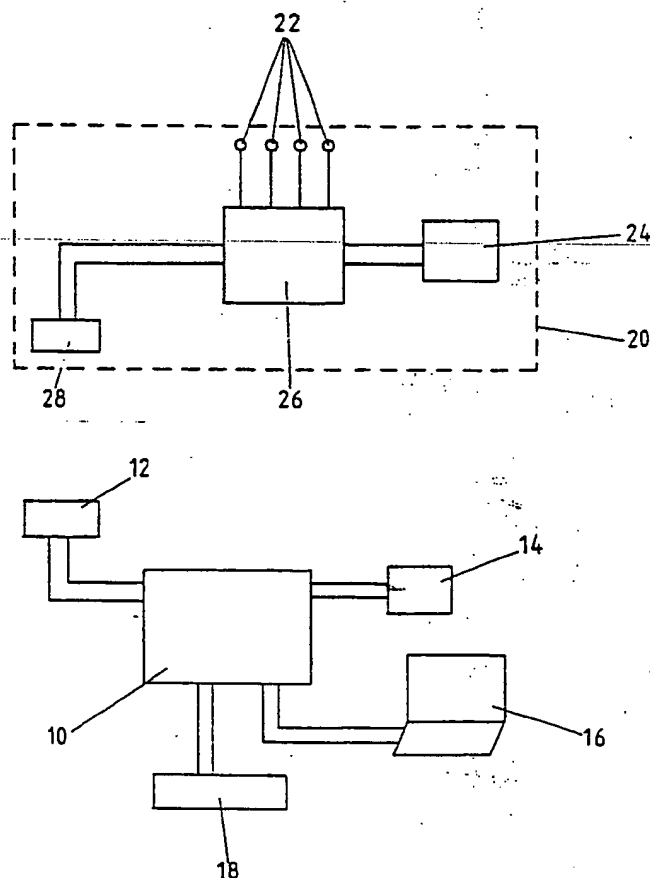
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/GB90/00221 (22) International Filing Date: 12 February 1990 (12.02.90) (30) Priority data: 8903123.1 11 February 1989 (11.02.89) GB (71) Applicant: WARNERDALE LTD. [GB/GB]; 12 Theodore Road, Port Talbot, West Glamorgan SA13 1SW (GB). (72) Inventor: LEWIS, Roger, William, Stuart ; 12 Theodore Road, Port Talbot, West Glamorgan SA13 1SW (GB). (74) Agent: GIBSON, Stewart, Harry; Urquhart-Dykes & Lord, Business Technology Centre, Senghennydd Road, Cardiff CF2 4AY (GB).		(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GB, GB ² (European patent), HU, IT (European patent), LU (European patent), NL (European patent), NO, RO, SE (European patent), SU. Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: VEHICLE MONITORING SYSTEM

(57) Abstract

A vehicle monitoring system comprises a unit (20) fitted on board a vehicle to monitor and record vehicle operating parameters, and a data processor unit (10) located at a base station to analyse data recorded by the on-board unit. A radio transmission system (28, 12) communicates the recorded data from the on-board unit to the base station data processor whilst the vehicle is on the road remote from the base station. The base station data processor is able to analyse the recorded data for preventive maintenance purposes.



Vehicle Monitoring System

This invention relates to a system for monitoring and recording operating parameters of a vehicle.

Systems are known for acquiring and recording data in respect of the operating parameters of a vehicle and enabling this data to be analysed at a central or base station. In US patent 4 188 618, data in respect of e.g. vehicle speed, trip distance, engine r.p.m. and fuel consumption is recorded in a data memory on-board the vehicle. When the vehicle reaches a base station, this data is transferred into a central computer of the base station, either by a direct cable connection which is made between the on-board system and a terminal of the central computer, or by a short-range radio transmission which is triggered by a proximity detector when the vehicle arrives. In the system disclosed in South African patent 8 401 416, data in respect of vehicle operating parameters is recorded in an on-board solid state acquisition unit, which can be removed when the vehicle reaches a base station and connected into a central computer for analysis of the data. However, it will be appreciated that in these known systems, the vehicle operating data can only be acquired by the base station once the vehicle arrives at that station. Further, whilst the on-board system of South African patent 8 401 416 can determine and notify the driver if a sensed parameter e.g. engine oil pressure departs from a safe limit, in effect this is only an emergency indication that a fault has already developed and a safe limit has been passed, and provides little advance notice that a fault is starting to develop.

In accordance with this invention, there is provided a vehicle monitoring system comprising a unit fitted on board the vehicle which monitors and records

vehicle diagnostic or preventative maintenance reports. For example, the base station processor can determine if any recorded parameter departs from a predetermined value for greater than a predetermined time period (e.g. if the cylinder head exceeds a predetermined temperature, or if the oil or water pressures fall below a predetermined level). In this manner, the base station processor can provide a report giving an early warning that the vehicle is developing a fault and should be brought in for maintenance before long. For a similar purpose, the processor may analyse the pressure and temperature variations to determine any trends which may indicate that the vehicle is developing a fault.

An embodiment of this invention will now be described by way of example only and with reference to the accompanying drawing, the single figure of which is a schematic block diagram of a vehicle monitoring system in accordance with the invention.

Referring to the drawing, there is shown a vehicle monitoring system comprising a data processor unit 10 located at a fixed base station and including a radio transmitter/receiver 12, data store 14, keyboard and display unit 16 and a printer 18. The system further includes a data acquisition unit 20 which is fitted on-board a vehicle and includes sensors 22 which monitor the various vehicle parameters in real time, a solid state data store 24, a central processing unit 26 and a radio transmitter/receiver 28. In practice the overall system will comprise a plurality of data acquisition units on-board respective vehicles in the fleet.

In operation, the sensors 22 on each vehicle continuously monitor the sensed parameters and a record is made in real time in the data store 24 under control of the central processing unit 26. The sensed and recorded data includes road speed, engine speed (r.p.m.), distance

may be communicated directly to the driver over the radio transmission link.

It will be appreciated that the system which has been described enables the data recorded on each vehicle to be made available promptly and analysed at the base station whilst the vehicle continues working without the need for the vehicle to call in at the base station or at any outlying stations or depots. Further, the data can be analysed to provide early warnings that the vehicle is developing a fault, so that preventative maintenance can be practised.

Further however and in accordance with a development of the system, a facility for automatic recalibration in respect of road speed may be provided. Thus, two radio beacons can be set up at a predetermined distance apart on selected roadways, directing their beams across the road. When a vehicle which has a system in accordance with the invention passes along such a roadway, it responds when traversing the radio beam of the first beacon to count the pulses from the road speed detector until the vehicle traverses the radio beam of the second beacon. From a knowledge of the distance between the two radio beacons, the speed of the vehicle is determined automatically and the system is recalibrated with respect to the pulses delivered from the road speed detector. With recalibration variations in the diameter of the roadwheel can be prevented from affecting the measured roadspeed.

managing a fleet of vehicles.

6) A vehicle monitoring system as claimed in claim 4 or 5, in which the base station processor is arranged to analyse the data which it receives for the purpose of preventative maintenance.

7) A vehicle monitoring system as claimed in claim 6, in which the base station processor monitors at least one vehicle parameter to determine if it departs from a predetermined value for greater than a predetermined time period.

8) A vehicle monitoring system as claimed in claim 6, in which the base station processor monitors at least one vehicle parameter to determine any long-term change in that parameter indicative of the vehicle developing a fault.

9) A vehicle monitoring system as claimed in any one of claims 4 to 8, in which the base station processor monitors at least one vehicle parameter to determine a proficiency rating for the vehicle driver.

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 G07C5/08

II. FIELDS SEARCHED

Minimum Documentation Searched⁷

Classification System	Classification Symbols
Int.Cl. 5	G07C ; G08G

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸

III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹


Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹¹
X	EP,A,0292811 (MOTOROLA) 30 November 1988 see column 3, line 23 - column 6, line 42; claims 1-10; figures	1, 3
Y	---	5-9
X	WESCON TECHNICAL PAPERS. vol. 20, no. 20, 1976, NORTH HOLLYWOOD US pages 1 - 10; BRAVMAN e.a.: "Automatic vehicle monitoring" see page 1, column 1, line 39 - page 1, column 2, line 17 see page 4, column 1, lines 8 - 17; figures	1-3
X	FR,A,2438877 (BARANOFF) 09 May 1980 see page 1, line 4 - page 3, line 20; figures	1, 2
A	---	4
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⁹ Special categories of cited documents : ¹⁰

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "Z" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search 31 MAY 1990	Date of Mailing of this International Search Report 21. 06. 90
International Searching Authority EUROPEAN PATENT OFFICE	Signature of Authorized Officer MEYL D. 

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.

GB, 9000221

SA 34346

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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01/06/90

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0292811	30-11-88	US-A- 4804937	14-02-89
FR-A-2438877	09-05-80	None	
EP-A-0032607	29-07-81	None	
US-A-4188618	12-02-80	US-A- 3835382	10-09-74
		CA-A- 1101552	19-05-81
		DE-A- 2715527	24-11-77
		US-A- 3950700	13-04-76
FR-A-2542478	14-09-84	None	
WO-A-8201354	29-04-82	US-A- 4715012	22-12-87
		AU-A- 7647481	11-05-82
		CA-A- 1180430	01-01-85
		EP-A, B 0070833	09-02-83
GB-A-2127554	11-04-84	DE-A- 3234727	22-03-84
		FR-A, B 2533518	30-03-84